

# Sample Proficiency Standards

The following general statements reflect ratings of student work created in response to a mathematically challenging task.

## Advanced

Student work is distinguished in that it goes well beyond the criteria for Proficient in an insightful and creative approach to the task. It includes:

- evidence of reflection upon one's work
- multiple solutions and/or solution strategies
- effective presentation of ideas, using a variety of forms (pictorial, graphic, symbolic, algebraic, verbal)
- evidence of exploration, conjecturing, generalizing, validating and justifying with use of examples and counterexamples when appropriate.

## Proficient

Student work completely addresses all aspects of the task. It includes:

- appropriate application of concepts, procedures, and structures although an occasional minor computational error may be present
- clear and complete explanations
- coherent use of mathematical words, symbols, or other visual representations that are appropriate to the task
- logical conclusions based upon known facts, properties and relationships.

## Basic

Student work addresses most of the essential conditions of the task. It includes:

- some evidence of the application of appropriate knowledge and skills
- reasonably clear explanations (which may not be complete)
- some accurate conclusions (although reasoning may be faulty or incomplete)
- evidence of some minor misconceptions

## Minimal

Student work addresses some of the essential conditions of the task. While it may include some positive elements, the work is characterized by:

- the presence of at least one major conceptual or procedural error
- unsatisfactory or missing communication
- a lack of detail/superficiality
- reasoning that is seriously flawed or completely missing

Example: A task for fourth grade students.

SUMS-O

Mrs. Lobato and her students enjoy playing an addition facts game called SUMS-O. The game uses all of the 100 flash cards with the basic addition facts. (*Basic facts* add 2 one-digit numbers.) It is played like BINGO, except that players get to make their own game boards.

SUMS-O Rules

- A player writes 9 different numbers in the squares on the game board.
- The game leader picks a flash card and players with the sum of the 2 numbers on the flash card cross it off their game board.
- The winner must have crossed off all three numbers in a row, column, or diagonal.

SUMS-O Game Board


Chris and Toni made these game boards.

6	7	8
3	2	1
9	11	13

CHRIS

2	4	6
12	14	16
22	24	26

TONI

.....

# Sample Proficiency Standards

## MATHEMATICS

### B. Number Operations and Relationships

#### CONTENT STANDARD

*Students in Wisconsin will use numbers effectively for various purposes, such as counting, measuring, estimating, and problem solving.*

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#### PERFORMANCE STANDARD

- B.4.5** In problem solving situations involving whole numbers, select and efficiently use appropriate computational procedures such as recalling the basic facts of addition, subtraction, multiplication and division

## MATHEMATICS

### E. Statistics and Probability

#### CONTENT STANDARD

*Students in Wisconsin will use data collection and analysis, statistics and probability in problem solving situations, employing technology where appropriate.*

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#### PERFORMANCE STANDARDS

- E.4.4** Determine if the occurrence of future events is more, less, or equally likely, unlikely, impossible, or certain
- E.4.5** Predict outcomes of future events and test predictions using data from a variety of sources

#### SAMPLE TASK

Successful completion of the task involves a thorough knowledge of the basic facts of addition, good number sense, and a realization that chances of winning are increased by: 1) choosing the sums that are more likely to occur in the game than other sums, and 2) placing those numbers in the optimal positions.

#### Advanced

Student work is distinguished in that it goes well beyond the criteria for Proficient in an insightful and creative approach to the task. It should include definite evidence of the recognition that the best chances of winning involve correct choice and placement of those numbers that will come up most often as sums. Written explanations should be clear and well organized.

#### Proficient

Student work completely addresses all aspects of the task. It should include correct use of computational procedures although an occasional minor error is allowed. Written or symbolic explanations should be easy to follow. Conclusions about the chances of winning of the two hypothetical students should be justified by examples, counter-examples, or citation of known mathematical properties.

#### Basic

Student work addresses most of the essential conditions of the task. Students may fail to address the chances of both hypothetical students. There might be some misconception about odd or even numbers. Respondent's own game board may be well filled out, but rationale may be sketchy, missing, or with evidence of some misconceptions.

#### Minimal

Student work addresses only some, or even none, of the essential conditions of the task. Written explanations, if any, may not fit numerical evidence presented. Student may criticize the choice of the hypothetical students, but then repeat the same choice in his/her own board. Rationale is completely faulty. Rules for filling out the game board are not followed.

# SAMPLES OF STUDENT WORK

## EXPLANATION OF RATINGS FOR STUDENT WORK

### Proficient

All aspects of the task are addressed. The explanation for Question 1 is clearly presented. Although the explanation for the student's own choice of a game board is non-verbal, it is well presented in such a way that one can easily understand why the various numbers were chosen. Inclusion of commutative pairs of addends (e.g.,  $9+6$  and  $6+9$ ;  $4+1$  and  $1+4$ ) is important.

On the other hand, this response does not merit an Advanced Rating. The organization on page 2 is not completely systematic and the better choices of 12 and 13 were not even considered. The location of numbers on the student's own game board suggests that optimal placement (center square is best, four corners are next best) of sums that have the highest likelihood of being called was not considered.

1. Explain what you think Chris' and Toni's chances of winning SUMS-O might be and why.

Chris has a better chance of winning because on Toni's card, there are the numbers 22, 24 and 26. If a basic fact is a one-digit plus another one-digit,  $9+9$  is the biggest problem, but it only equals 18. So 22, 26, and 24 would be impossible to get a basic fact of.

2. Write numbers in the game board that you would use to try to win SUMS-O.

11	6	7
<del>5</del>	8	10
9	15	4

MY GAME BOARD

3. Explain why you think this will give you a very good chance of winning.

Because

.....

## Basic

All aspects of the task are addressed but there is no recognition that Toni has some impossible numbers. The explanation for Question 3 is clear and understandable, but shows some misconception that chance of winning is based solely on a balance of odd and even numbers, and not on choice of sums that are more likely to occur than others.

1. Explain what you think Chris' and Toni's chances of winning SUMS-O might be and why.

Toni's winning is probably <sup>good</sup> better because she/he has all even numbers and ~~it~~ is a good chance to get doubles. Chris is okay too because sometimes you pull out four a lot and most of his can get four in them.

2. Write numbers in the game board that you would use to try to win SUMS-O.

4	8	10
5	9	13
12	18	14

MY GAME BOARD

3. Explain why you think this will give you a very good chance of winning.

I think this will give me a good chance of winning because I have some odd some even which balances it off because sometimes you get odd numbers and sometimes you get even,

The explanation for Question 1 indicates a misinterpretation of the rules; the student believes the numbers on the board themselves must be added and the sum must also be on the board. The choice of numbers put on the student's own gameboard violate the rules of the game—repetitions and impossibles sums (0 and 1). However, the student **did try** and that is an important fact in his/her favor. It must also be noted that all of the indicated sums and differences written on the paper are correct with the one exception of  $22 + 24 = 26$ .

- Yes, for Chris because ~~Yes, because that is~~  
 $7+1=8 \dots 9+2=11 \dots$  well because Yes, because  
 $11+2=13 \dots 6+1=7 \dots$  he has good ones too  
 like  $2+4=6 \dots 12+4=16 \dots$   
 $22+24=46 \dots 676=12 \dots$

- |   |   |    |
|---|---|----|
| 9 | 1 | 10 |
| 0 | 1 | 1  |
| 9 | 2 | 10 |

I got a good chance of winning because  $9+1=10$ ,  $10-1=9$ ,  $9-0=9$ , and  $1+1=2$ .